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Three New Species of *Sarcophaga* (Insecta: Diptera: Sarcophagidae) from Timor, with a Lectotype Designation for *Myophora peronii*

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Three new species of *Sarcophaga* Meigen, 1826 are described from Timor (Indonesia), viz., *Sarcophaga* (*Sarcorohdendorfia*) *ikat* sp. n., *S.* (*S.*) *uncus* sp. n., and *S.* (*Lioproctia*) *serratocudo* sp. n. The nominal taxon *Myophora peronii* Robineau-Desvoidy, 1830, with the type locality Timor and previously considered a *nomen dubium*, is revised and proposed as a senior synonym of *Sarcophaga tibialis* Macquart, 1851, syn. n. Prevailing usage is maintained through reversed priority: *Myophora peronii* qualifies as a *nomen oblitum*, while *Sarcophaga tibialis* is shown to qualify as a *nomen protectum*. The delimitation of several *Sarcophaga* subgenera, *Johnstonimyia* Lopes, 1959, *Sarcorohdendorfia* Baranov, 1938, *Seniorwhitea* Rohdendorf, 1937, and *Lioproctia* Enderlein, 1928, is briefly discussed and three species are transferred from *S.* (*Johnstonimyia*) to *S.* (*Sarcorohdendorfia*): *S.* (*Sarcorohdendorfia*) *gorokaensis* Sugiyama, Shinonaga and Kano, 1988; *S.* (*Sarcorohdendorfia*) *hugoi* Pape, 1996; and *S.* (*Sarcorohdendorfia*) *vanuatu* Pape, 1991. The apparently convergent evolution of golden abdominal coloration in several species of *Sarcophaga* on Timor is discussed.

Key Words: Sarcophagidae, *Sarcophaga*, Timor, new species, new record, abdominal colour, *nomen oblitum*, *nomen protectum*.

Introduction

The Sarcophagidae of Nusa Tenggara or the Lesser Sunda Islands—Bali, Lombok, Sumbawa, Sumba, Flores, Timor—are poorly known. According to the recent world catalogue (Pape 1996), no species has so far been recorded from Lombok or Sumbawa, three species are recorded from Bali [*S. taenionota* (Wiedemann, 1819); *S. souzalopesi* Pape, 1996; *S. orientalis* Parker, 1917], two from Timor [*S. aureolata* Pape and Kurahashi, 2000; *S. timorensis* (Kano and Shinonaga, 1977)], one from Flores [*S. koimani* (Kano and Shinonaga, 1977)], and one from Sumba [*S. petiolata* (Baranov, 1941)]. The low species count for Nusa Tenggara is evidently due to insufficient collecting, and there are good reasons to expect a much higher number of Sarcophagidae. Pape (1998a) estimated that up to two-thirds of the species of Sarcophagidae in the Malay Archipelago remain to be discovered. Medium-sized and smaller islands tend to have significantly reduced numbers of Sarcophagidae (Pape 1996), but the closeness of Nusa Tenggara to Java (20 species), Sulawesi (14 species), and Maluku (11 species) may facilitate dispersion and thereby increase species numbers. It is noteworthy, though, that the few species hitherto known from Timor, Flores, and Sumba are each endemic to its particular island.

Pape and Kurahashi (2000) remarked on the species known from Timor and described the endemic *Sarcophaga* (*Liopygia*) *aureolata*, which shares an abdominal pattern of golden lateral markings (Fig. 15) with the only other species then known to these authors from the island, *S.* (*Boettcherisca*) *timorensis*. Additional sarcophagid specimens from Timor have been made available to the authors, and this material contains three species new to science, which are described and named below. Also, we take the opportunity to revise the nominal taxon *Myophora peronii* Robineau-Desvoidy, 1830, which was described from Timor but never since treated as a valid species (see Pape and Kurahashi 2000).

Material studied during the present study has been deposited in the following institutions: BMNH, The Natural History Museum, London; BPBM, Bernice P. Bishop Museum, Honolulu; MNHN, Muséum National d'Histoire Naturelle, Paris; LIPI, Puslitbang Biologi LIPI (Indonesian Institute of Sciences), Cibinong; NSMT, National Science Museum, Tokyo; SMNH, Swedish Museum of Natural History, Stockholm.

Nomenclature

Sarcophaga tibialis Macquart, 1851, nom. protect.

Myophora peronii Robineau-Desvoidy, 1830: 341 (type locality: Indonesia, Timor). **Nom. oblit.** [Senior synonym of *Sarcophaga tibialis* **syn. nov.**]

Sarcophaga tibialis Macquart, 1851: 251 (type locality: Africa). **Nom. protect.** [Junior synonym of *Myophora peronii*]

Myophora peronii Robineau-Desvoidy, 1830

Type material. Lectotype: male, herewith designated in order to support unambiguously the synonymy proposed below, and thus promote nomenclatural stability; deposited in MNHN.

The lectotype is provided with the following four labels, all handwritten: tim. [large, round label]; G. Myophora/m. Peronii RD [long label, folded twice]; S. peronii [long label, folded twice]; Lectotype ♂/Myophora/peronii R-D/T.Pape det. 2002 [red label].

The lectotype is in fair condition but partly moulded and very dusty; it lacks the right antenna distal to the pedicel, the left arista, and the left mid leg; the terminalia have been dissected (by TP) by cutting through the margin of abdominal tergite 5, leaving the remaining part of the tergite intact; the terminalia are in good condition and glued to the round label below the specimen.

Additional material. One male standing with the lectotype appears to be part of the original type material and is here accordingly considered a paralectotype. The specimen carries a large, round label with no text and a label with the number "170". The specimen is heavily moulded and very dirty, with a transverse crack through the notum at the level of the pin and with the anterior right part of the notum pressed down, but otherwise intact. It has been dissected the same way as the lectotype, with which it is conspecific.

Identity. *Myophora peronii* Robineau-Desvoidy, 1830 is a senior synonym of *Sarcophaga tibialis* Macquart, 1851.

Remarks. A record of *Sarcophaga tibialis* from Timor is somewhat unexpected; this species so far has been recorded only from the Afrotropical region, the western Palaearctic, the Seychelles, the Chagos Archipelago, French Polynesia, and New Caledonia (Pape 1990, 1996). The scattered island records probably refer to introductions in historic times, and we consider the Timor record similarly.

Pape and Kurahashi (2000) considered it unlikely that the name *Myophora peronii* would be a threat to more recent names due to the recent changes in the International Code of Zoological Nomenclature moderating the Principle of Priority and allowing for reversed priority in order to protect prevailing usage (International Commission on Zoological Nomenclature 1999: ICZN Art. 23.9). The name *Myophora peronii* has not been used as valid since it was proposed by Robineau-Desvoidy (1830), and this can be applied to the condition in Art. 23.9.1.1 of ICZN, while *Sarcophaga tibialis* is a well-known name for a widespread carrion-breeding species of forensic interest that is frequently used in insect-physiological studies. An online search (November 2003) through Biological Abstracts® using the search terms "Sarcophaga tibialis" and "Parasarcophaga tibialis" gave a total of 16 references since 1969, written by no less than 21 authors. Further references may be extracted from Biosis®, yet even more exist that are not readily retrieved from online sources. We have found the following references in which *S. tibialis* is used as a valid name, yet most probably several more may be found: Lewis (1955), Orian (1962), Rickenbach *et al.* (1962), Rohdendorf (1963, 1975), Stanek (1968), Abasa (1970, 1971, 1972a, b), Zumpt (1972), Reed (1974), Arnaud (1975), Lehrer and Luciano (1979), Pearson *et al.* (1979), Dear (1980), Olembo and Pearson (1982), Kokwaro (1983a, b), Beaver (1986), Verves (1986), Pape (1990, 1996, 1998b), Amoudi (1993), Povolný and Verves (1997), Peris *et al.* (1999), McGowan *et al.* (2001), Musvasva *et al.* (2001), Shinonaga (2001), Lehrer (2002), Pape *et al.* (2002).

This amply exceeds the 25 references by ten authors within no less than ten of the last 50 years as required by ICZN Art. 23.9.1.2. We therefore declare *Myophora peronii* Robineau-Desvoidy, 1830 to be a *nomen oblitum*, and *Sarcophaga tibialis* Macquart, 1851 to be a *nomen protectum*.

Taxonomy

Sarcophaga (Sarcorohdendorfia) ikat sp. n.

(Figs 1–4, 18)

Etymology. From "ikat", of Malayan origin and meaning to tie or bind, now also used for a widespread weaving technique in which one tie-dyes and weaves the yarn to create an intricately designed fabric. Ikat cloth is now most often associated with Indonesian textiles, and outstanding ikat products comes especially from Nusa Tenggara. The species epithet, which should be treated as a noun in apposition, is a tribute to the fine weaving tradition of Nusa Tenggara.

Type material. Holotype: male, Indonesia, Timor, Nusa Tenggara Timur, Fatumnasi, 1,400 m alt., forest, 31.vii.1998, H. Kurahashi (deposited in LIPI). Paratype: 1 male, same data as holotype (in NSMT, dissected and with terminalia in glycerine).

Description. *Male.* Body length 16.5–18.5 mm.

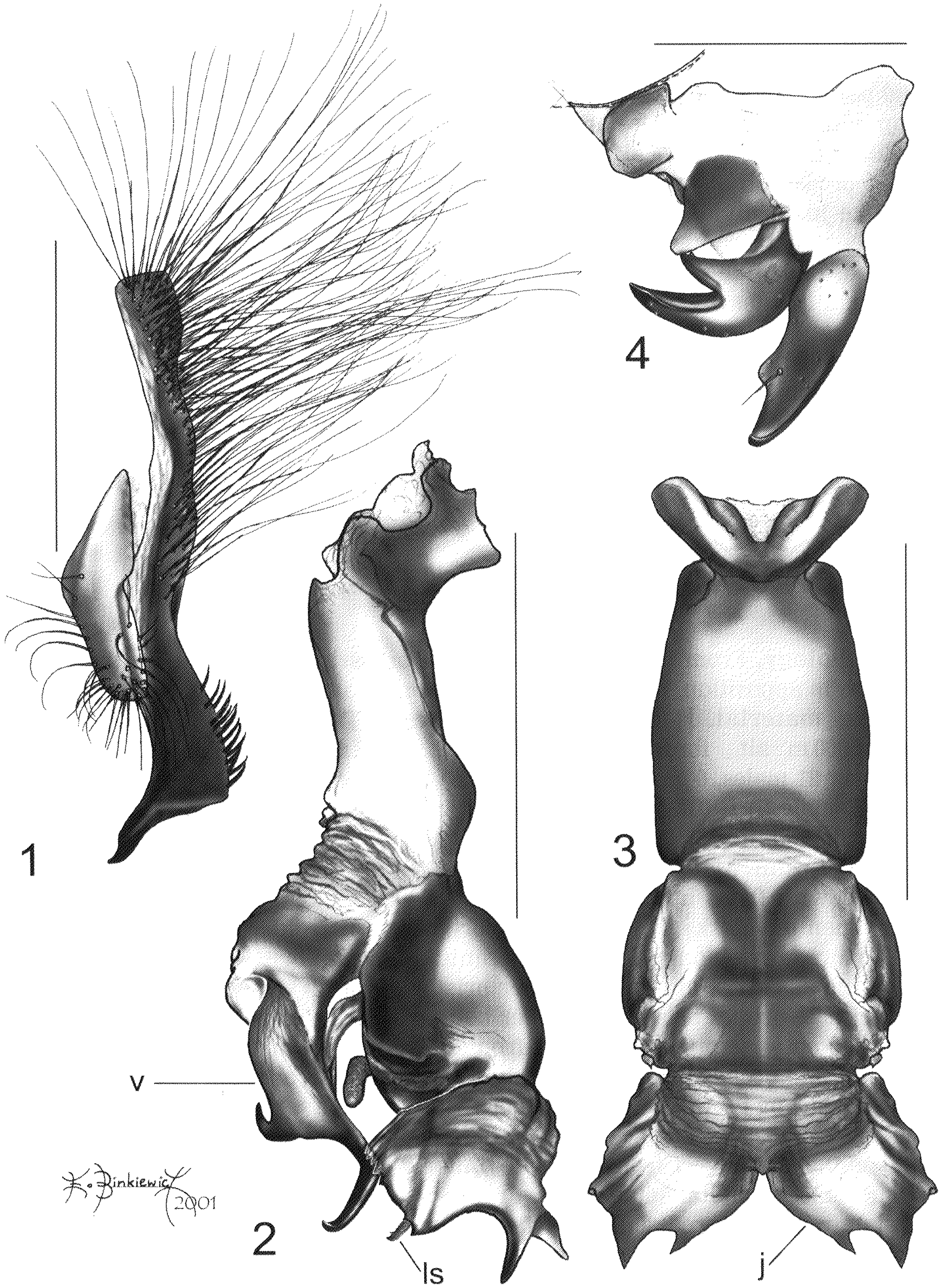
Head with frons at narrowest point 0.16–0.17×maximum head width (n=2). Microtomentum silvery grey, with yellow to golden tinge on fronto-orbital plate, parafacial plate, and postocular strip, and with weak yellow tinge on anterior part of gena. Frontal bristles strongest at lunule, continuing as row of gradually weaker bristles towards vertex and ending just before reclinate orbital bristle, this latter being situated at level of anterior ocellus and almost as strong as strongest frontal bristle. Ocellar triangle with scattered setae and weak ocellar bristles about as strong as weakest frontal bristle. Postocellars and postverticals conspicuous and stronger than weakest frontals. Inner vertical well developed, stronger than strongest frontal bristle; outer vertical not differentiated from postocular setae. Occipital setae black in about four irregular rows behind ocular setae, otherwise white. Fronto-orbital and upper-most part of parafacial plate with few scattered setae; parafacial plate otherwise with single row of weak bristles. Gena with black setae except for posterior 0.2 with white setae; postgenal setae white. Antenna black; palpus black.

Thorax grey, with usual three black dorsal stripes (paratype with slight yellowish tinge). Prosternum with black setae; depressed part of proepisternum densely beset with black setae. Chaetotaxy of notum: acrostichals=1 (weak)+1, dorsocentrals=5–6+4, intra-alars=1(–2)+2, supra-alars=2+3, postalars=2, humerals=3 (forming broadly obtuse triangle); scutellum with 2 laterals, 1 pair of weak discals, and 1 pair of apicals (discals 0.5, apicals 0.7× length of posterior lateral). Notopleuron with scattered setae in addition to usual primary and subprimary bristles.

Legs black, with strong (fore femur) to medium (mid and hind femora) grey microtomentum; tibiae and tarsi atomentose. Ventromedian setae of hind trochanter short and bristly, setae of mid trochanter not modified. Mid femur with row of stout postero-ventral bristles apically (not short and robust enough to form distinct "comb"). Hind tibia with numerous elongated, hair-like setae, even a few on mid tibia. Hind femur with no bristly setae antero-ventrally nor postero-ventrally.

Wings with upper and lower calypteres (incl. fringing hairs), basicosta, and basal half of wing membrane bright orange (but holotype with right lower calyptere whitish on entire disc, leaving only broad orange rim); colour continuing and gradually fading along veins (i.e., no sharp limit to non-coloured wing membrane). Tegula black. Vein R_1 bare.

Abdomen black with grey (dorsally) to silvery grey (laterally and ventrally) microtomentum, with three broad black stripes running entire length (but median stripe narrow on T5). Black and silvery colour pattern slightly changing with incidence of light, especially laterally and ventrally. ST4 with posterior pad of dense, short setae; pad distinctly delimited (but not with very abrupt transition to much shorter clothing setae as seen in other *Sarcorohdendorfia*). Sternites otherwise with unmodified clothing setae. ST5 deeply V-shaped and densely beset with strong bristles along inner margin of incision. T4 with pair of strong median marginal



Figs 1–4. *Sarcophaga* (*Sarcorohdendorfia*) *ikat* sp. n., male terminalia. 1, Male cercus and surstylus, left lateral view; 2, phallus, left lateral view; 3, phallus, posterior view; 4, gonopod and paramere, left lateral view. Scale=0.5 mm. Abbreviations: j=juxta, ls=lateral stylus, v=vesica.

bristles; T5 with row of marginals.

Terminalia with protandrial segment lacking marginal bristles, black, with dense grey microtomentum; epandrium shining black; cercus black. Cercus with distal part distinctly curved; cercal tip slender and distinctly set off from subapical hump with bristly dorsal setae. Paramere straight, with strong curve on anterior margin at level of subapical bristle. Gonopod strongly curved, unevenly bifid. Sclerotized projection at base of gonopod (possibly part of hypandrium). Phallus with hood-like juxta divided into diverging flaps; distal margin of each flap with two pointed extensions. Vesica with slender, finger-like projection distally and small, recurved, hook-like process antero-medially. Lateral styli slender, just visible beyond juxta in lateral view.

Female. Unknown.

Distribution. Oriental: Indonesia (Timor).

Remarks. The present specimens key out to *S. zeta* (Johnston and Tiegs, 1921) in Lopes and Kano (1979), yet the male terminalia are remarkably different, especially in the long, finger-like terminal projection of the vesica and the division of the juxta into two broad halves, each with two pointed extensions apically.

Sarcophaga* (*Sarcorohdendorfia*) *uncus sp. n.

(Figs 5–10, 16)

Etymology. From the Latin *uncus* (hook or barb). The species epithet, which is a noun in apposition, refers to the barbed condition of the juxtal tip.

Type material. Holotype: male, Indonesia, Timor, Nusa Tenggara Timur, Kapan, 900 m alt., forest, 31.vii–2.viii.1998, H. Kurahashi (deposited in LIPI). Paratypes: 21 males, 6 females, same data as holotype (1 male, 1 female in BMNH; 1 male, 1 female in BPBM; 1 male, 1 female in LIPI; 16 males, 2 females in NSMT; 2 males, 1 female in SMNH).

Description. *Male.* Body length 11.5–16.5 mm.

Head with frons at narrowest point 0.21–0.24×maximum head width (n=21). Microtomentum dark greyish golden, brightest on fronto-orbital and parafacial plates, more greyish on gena and postcranium. Frontal bristles strongest at lunule, continuing as row of gradually weaker bristles towards vertex and ending well before reclinate orbital bristle, this latter being situated just in front of anterior ocellus and about as strong as strongest frontal bristle. Ocellar triangle with few irregular setae and ocellar bristles variously developed, from as weak as ocellar setae to almost as strong as weakest frontal bristle. Postocellars and postverticals conspicuous and almost as strong as weakest frontals. Inner vertical well developed, stronger than strongest frontal bristle; outer vertical not differentiated from postocular setae. Occipital setae black. Fronto-orbital and upper-most part of parafacial plate with scattered setae; parafacial plate otherwise with single row of weak bristles. Gena with black setae; postgenal setae whitish except for few black setae in antero-ventral part. Antenna and palpus black.

Thorax yellowish grey dorsally and with usual three black stripes, blackish grey laterally. Prosternum with black setae; depressed part of proepisternum extensively covered with black setae. Chaetotaxy of notum: acrostichals=0+1, dorsocentrals=5–7+4, intra-alars=1+2, supra-alars=2+3, postalars=2, humerals=3 (forming obtuse triangle); scutellum with 2 laterals (posterior lateral occasionally with subordinate bristle), 1 pair of discals (0.7× length of posterior lateral) in almost apical position, apicals absent. Notopleuron bare except for usual primary and subprimary bristles.

Legs black with medium (fore femur) to sparse (mid and hind femora) grey microtomentum; tibiae and tarsi atomentose. Ventromedian setae of mid and hind trochanters not modified. Mid femur with row of long and bristly postero-ventral setae apically. Hind tibia with few or no elongated, hair-like setae. Hind femur with few bristly setae antero-ventrally in middle, no bristles postero-ventrally.

Wings with upper and lower calypteres (incl. fringing hairs), tegula, basicosta, and basal half of wing membrane bright orange; colour continuing and gradually fading along veins (i.e., no sharp limit to non-coloured wing membrane). Vein R_1 bare.

Abdomen dorso-laterally on T1+2–T4 with golden yellow spots separated from posterior margin by narrow black rim. T5 with almost all of dorsal surface golden yellow, with only very narrow black median stripe. Non-golden dorsal and ventral parts of abdominal tergites velvety black. Lateral yellow microtomentum with abrupt transition to velvety black ventral microtomentum. Sternites black with grey microtomentum, latter disappearing when viewed at certain angles; sternal setae not modified. ST5 deeply V-shaped and with row of strong bristles along inner margin of each arm. T3 with pair of strong median marginal bristles; T4–5 with row of marginals.

Terminalia with protandrial segment lacking marginal bristles, black, with sparse grey microtomentum; epandrium shining black or blackish brown; cercus black. Cercus gently curved, with low hump dorsally at about middle; distal half gradually tapering, pointed (Fig. 10). Distal half with scattered, spiny bristles. Paramere with small apical hook or rounded apex, with 1–2 bristles on anterior margin (Fig. 5a). Gonopod gently curved, with slender apical half abruptly set off from much broader proximal half (Fig. 5). Phallus with sclerotized proximal part of distiphallus long and narrow, appearing *Liosarcophaga*-like especially in dry specimens (Fig. 7). Juxta tapering but with tip equipped with pair of small, triangular barbs (Figs 8a, b, 9). Harpes broad and flattened in horizontal plane (Fig 6), projecting arm-like perpendicular to longitudinal axis of phallus and appearing as narrow, rod-like structures in strict lateral view (Figs 7, 8). Lateral styli semi-slender and reaching almost as far as tip of juxta (Figs 8, 9).

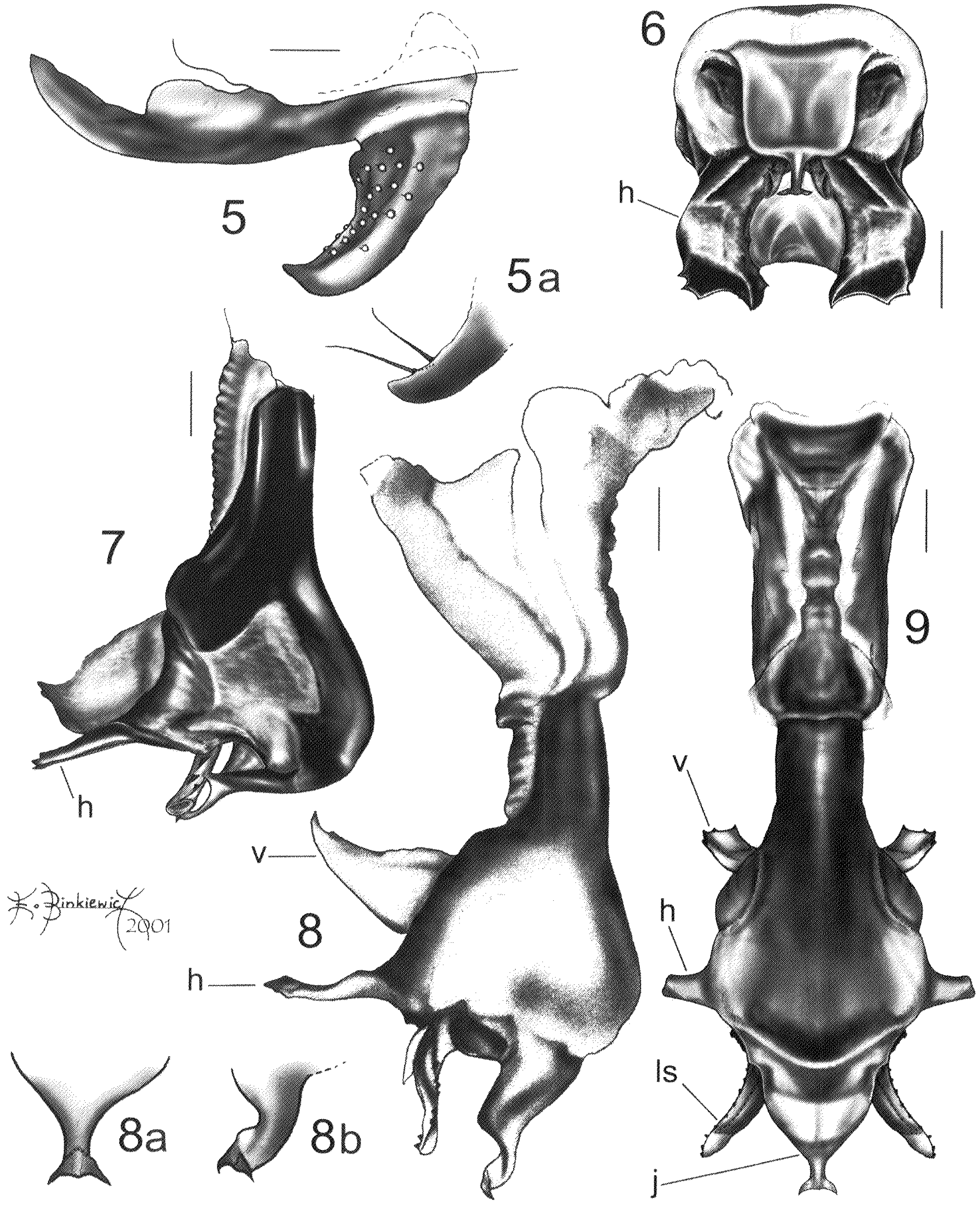
Female. Body length 13.2–14.0 mm.

Like male in general appearance apart from broader frons, two proclinate orbital bristles, and more robust abdomen. Frons at narrowest point 0.26–0.27×maximum head width (n=6). Terminalia black.

Distribution. Oriental: Indonesia (Timor).

Remarks. There is a noteworthy difference in appearance between the phallus illustrated *in situ* from a pinned male (Fig. 7), and that of a phallus from KOH-treated terminalia kept in glycerine (Fig. 8). The latter has the juxta raised, revealing the lateral styli, and the vesica is directed more towards the base and is thus distinctly separated from the harpes. It should be noted, however, that even small differences in orientation of the very three-dimensional phallus causes profound differences in the outline.

The present material keys out to *S. separata* Lopes, 1967 in the key provided by



Figs 5–9. *Sarcophaga* (*Sarcorohdendorfia*) *uncus* sp. n., male terminalia. 5, Gonopod and paramere, left lateral view—5a, tip of right gonopod showing subapical setae; 6, phallus, apical view; 7, distiphallus, left lateral view; 8, phallus, left lateral view (basiphallus slightly damaged), with tip of juxta in anterior (8a) and lateral (8b) view; 9, phallus, posterior view. Abbreviations: h=harpes, j=juxta, ls=lateral stylus, v=vesica. Scale=0.1 mm.

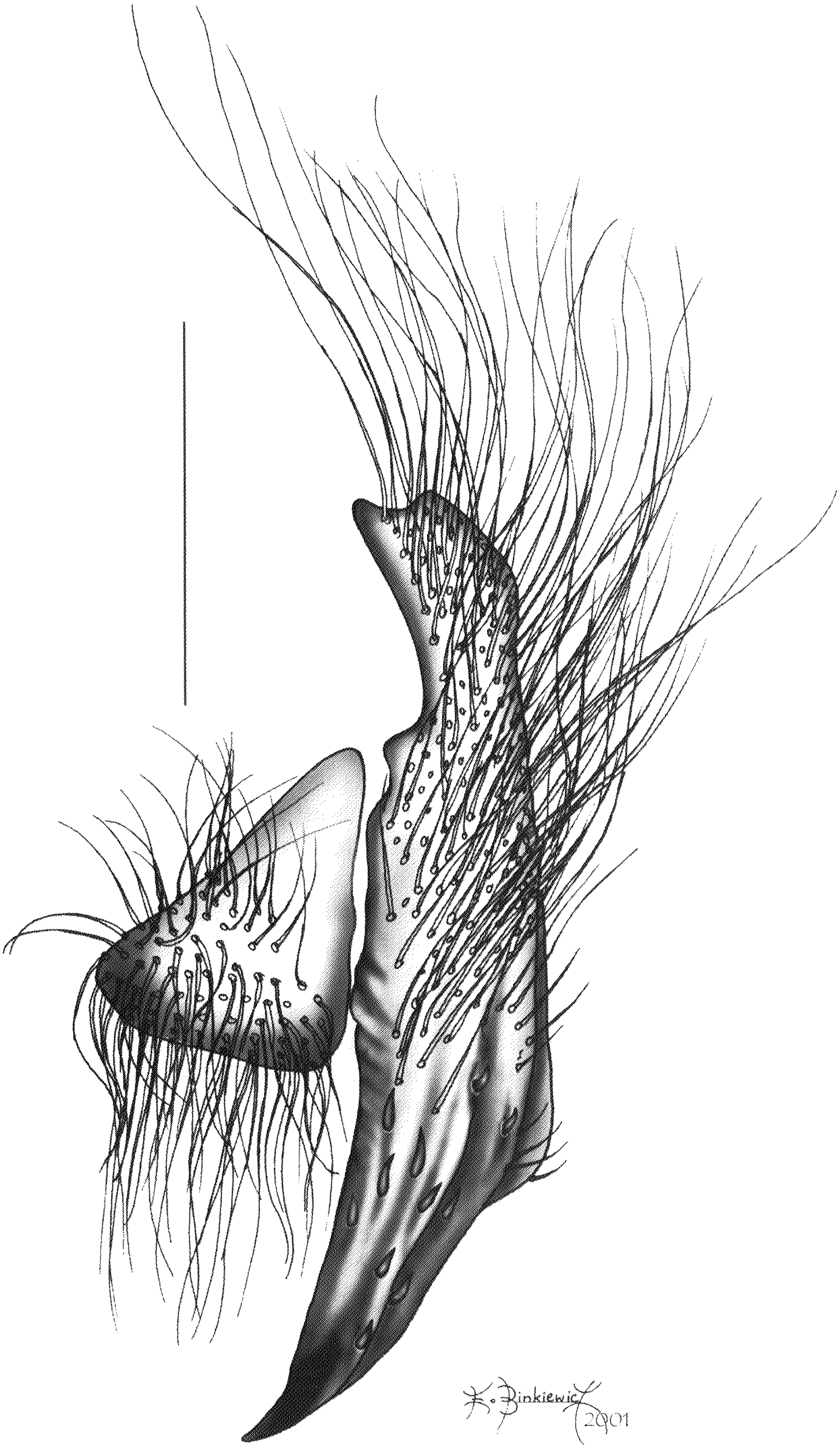


Fig. 10. *Sarcophaga* (*Sarcorohdendorfia*) *uncus* sp. n., male cercus and surstylus, left lateral view. Scale=0.5 mm.

Lopes and Kano (1979), but the latter species has a more even distribution of yellowish abdominal colour (i.e., not restricted to spots), while the abdomen of *S. uncus* has the yellow and much more golden colour confined to spots, and a velvety black dorsum. *Sarcophaga separata* has male sternite 5 with a large and broad "brush" of densely set spiny bristles occupying the entire width of the sternite, while *S. uncus* has male sternite 5 without any trace of a "brush". Also, possession of small triangular barbs at the very tip of juxta is a feature unique to *S. uncus*.

Sarcophaga* (*Lioproctia*) *serratocudo sp. n.

(Figs 11–14, 17)

Etymology. From the Latin *serra*, *serrata* (saw, toothed like a saw) and *cudo* (a helmet made from raw skin). The species epithet, which should be treated as a noun in apposition, refers to the serrate condition of the helmet- or cap-like juxta.

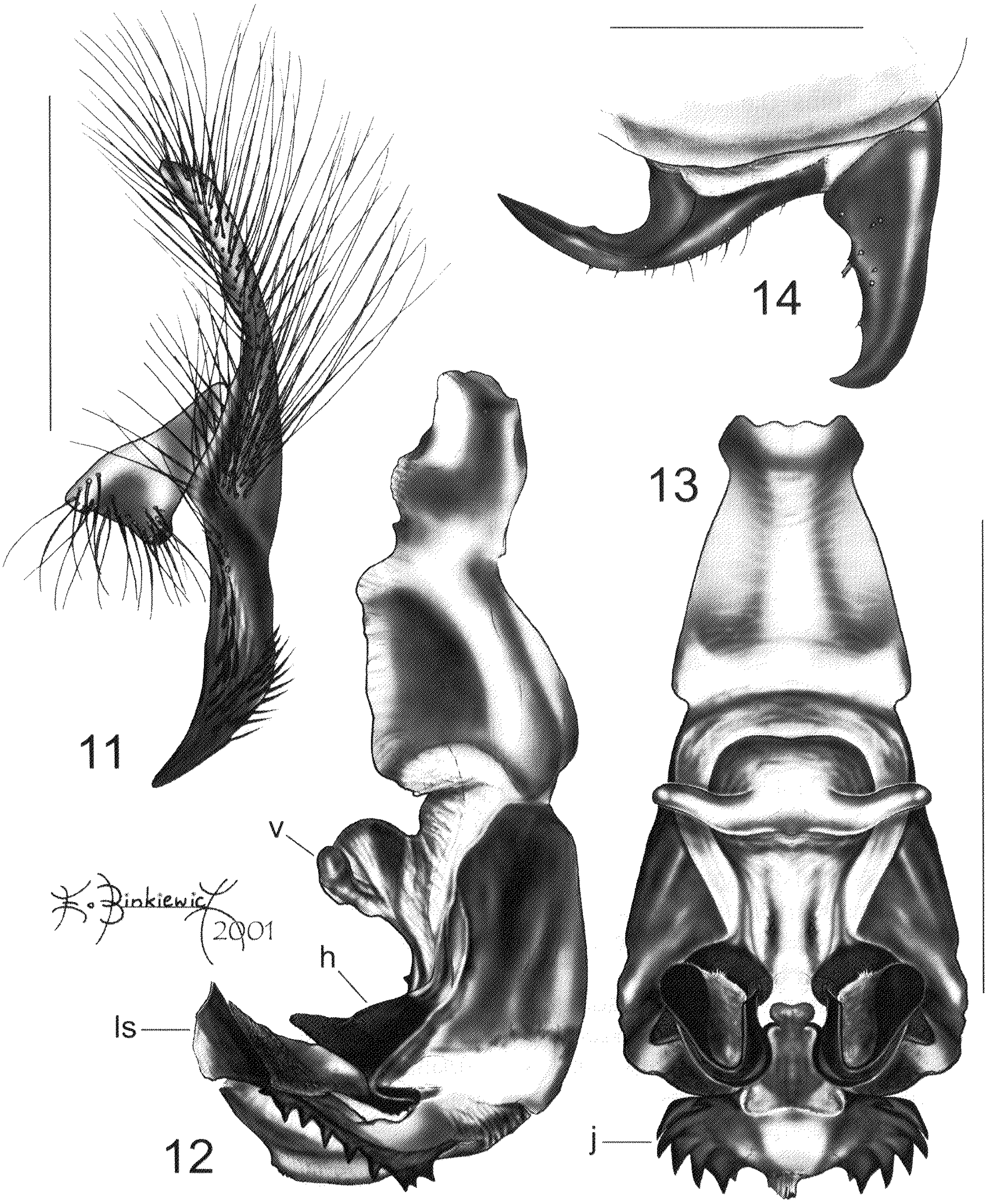
Type material. Holotype: male, Indonesia, Timor, Nusa Tenggara Timur, Soe, 800 m alt., forest, 30.vii.1998, H. Kurahashi (deposited in LIPI). Paratypes: 3 males, Indonesia, Timor, Nusa Tenggara Timur, Ngilmina, 300 m alt, hill forest, 3.viii.1998, H. Kurahashi (1 in BPBM; 1 in NSMT; 1 in SMNH); 2 males, 1 female, same data as holotype (1 male in BMNH; 1 male, 1 female in NSMT).

Description. *Male*. Body length 17.0–19.0 mm.

Head with frons at narrowest point 0.18–0.19× maximum head width (n=5). Microtomentum silvery grey, with yellow to golden tinge on fronto-orbital plate, parafacial plate, and postocular strip. Frontal bristles strongest at lunule, continuing as row of gradually weaker bristles towards vertex and ending just before reclinate orbital bristle, this latter being situated about at level of anterior ocellus and about as strong as strongest frontal bristle. Ocellar triangle with scattered setae and weak ocellar bristles barely stronger than ocellar setae and weaker than weakest frontal bristle. Postocellars and postverticals conspicuous and stronger than weakest frontals. Inner vertical well developed, stronger than strongest frontal bristle; outer vertical not differentiated from postocular setae. Occipital setae black in two irregular rows behind ocular setae, otherwise white. Fronto-orbital and upper-most part of parafacial plate with few scattered setae; parafacial plate otherwise with single row of weak bristles. Gena with black setulae in anteriormost part, otherwise with white setae; postgenal setae white. Antenna blackish brown; palpus black.

Thorax grey with usual three black dorsal stripes. Prosternum with black setae, depressed part of proepisternum bare. Chaetotaxy of notum: acrostichals=0 (occasionally 1 weak bristle)+1 (weak), dorsocentrals=5–6+4 (only 2 posterior ones strong), intra-alars=1+2, supra-alars=2+3, postalars=2, humerals=3 (forming obtuse triangle); scutellum with 2 laterals, 1 pair of discals, and 1 pair of apicals (discals and apicals 0.5× length of posterior lateral). Notopleuron with scattered setae in addition to usual primary and subprimary bristles.

Legs black with medium (fore femur) to sparse (mid and hind femora) grey microtomentum; tibiae and tarsi atomentose. Ventromedian setae of mid and hind trochanters not modified. Mid femur with row of stout postero-ventral bristles apically (not short and robust enough to form distinct "comb"). Hind tibia with numerous elongated, hair-like setae, even a few on mid tibia. Hind femur with few



Figs 11–14. *Sarcophaga* (*Lioproctia*) *serratocudo* sp. n., male terminalia. 11, Male cercus and surstylus, left lateral view; 12, phallus, left lateral view; 13, phallus, anterior view; 14, gonopod and paramere, left lateral view. Abbreviations: h=harpes, j=juxta, ls=lateral stylus, v=vesica. Scale=0.5 mm.

bristly setae antero-ventrally in middle, no bristles postero-ventrally.

Wings with upper and lower calypteres (incl. fringing hairs), basicosta, and basal half of wing membrane bright orange; colour continuing and gradually fading along veins (i.e., no sharp limit to non-coloured wing membrane). Tegula black. Vein R_1 bare.

Abdomen velvety black dorsally and laterally with continuous golden-yellow microtomentum, i.e., latter not separated into spots. T1+2–T3 with sparse golden-grey microtomentum laterally (not visible in dorsal view), with two grey spots dorsally, otherwise black. T3 with two oval, grey, posteriorly tapering spots dorsally. T5 with broad median blackish stripe. Remaining dorsal part of abdomen velvety black; ventral part with sparse but distinct grey microtomentum, changing slightly depending on angle of incidence of light. Lateral yellow microtomentum with short transition (i.e., not abrupt) to grey ventral microtomentum. Setae of sternites 1–4 and ventral part of tergites becoming shorter posteriorly; segments 4–5 with very short setae. ST5 with medium-sized, U-shaped incision, with row of strong bristles along inner margin of incision. T3–T4 with pair of strong median marginal bristles; T5 with row of marginals.

Terminalia with protandrial segment lacking marginal bristles, dark blackish brown, with sparse grey microtomentum; epandrium shining blackish brown; cercus black. Cercus with apical 0.2 gently curved and gradually tapering, with strong setae dorsally on curved part and spiny bristles along ventral margin (Fig. 11). Paramere with apical hook and strong bristle on ventral margin just proximal to middle (Fig. 14, note broken bristle). Gonopod with strong bend at about mid-length, apical half gradually tapering (Fig. 14). Phallus superficially *Helicophagella*-like with compact, arching distiphallus and broad, parallel yet not adpressed lateral styli visible under juxta (Fig. 12). Juxta peculiar in having dentate or serrate margin (Fig. 13). Vesica small and not particularly strongly sclerotized, with pair of tubular extensions projecting transversely (Figs 12, 13).

Female. Body length 15.5 mm.

Like male in general appearance apart from broader frons, presence of two proclinate orbital bristles, and more robust abdomen. Frons at narrowest point 0.27× maximum head width (n=1). Terminalia black.

Distribution. Oriental: Indonesia (Timor).

Remarks. *Sarcophaga serratocudo* shares several similarities with the Oriental *S. annandalei* Senior-White, 1924, as is discussed further below (cf. Nandi 2002, fig. 434), yet it may be differentiated from this species by the features mentioned in the following couplet.

1. Abdomen velvety black dorsally, with golden microtomentum laterally. Wing membrane distinctly yellow in basal half (colour gradually fading distally). Epandrium blackish brown. Lateral styli reaching just beyond tip of juxta. Distance from tip of lateral styli to vesica (lateral view) about equal to length of harpes. Serrated margin of juxta with more than 5 distinct "teeth". Distance between dentate margins of juxta more than diameter of one lateral stylus. Lateral arms of vesica blunt, not bilobed.. *S. serratocudo*

– Abdomen black and silvery grey, with three black stripes on each segment. Wing membrane with faint yellow tinge in basal half. Epandrium reddish. Lateral styli not reaching tip of juxta. Distance from tip of lateral styli to vesica (lateral view) much less than half length of harpes. Serrated margin of juxta with less than 5 distinct "teeth". Distance between dentate margins of juxta less than half diameter of one lateral stylus. Lateral arms of vesica distally bilobed .... *S. annandalei*

Discussion

The genus *Sarcophaga* Meigen, 1826 (s. lat.) is notoriously difficult to partition into well-defined subgenera, yet it is so rich in species that subgroups are needed for proper communication and to facilitate identification. Species are often kept together within their particular "groups" based on non-explicit or loosely formulated concepts of similarity. Differences in the complex male genitalia may be more evident to the observer than are the similarities, or at least more easy to describe, with the result that new subgenera (equally often full genera) are continuously being erected, and the relative proportion of monotypic subgenera within *Sarcophaga* (s. lat.) has surpassed 50% (Pape 1996 and unpubl.). We find the quest for similarities equally challenging, and in many ways more rewarding than enumerating the differences, and for this reason we will try to outline our reasons for the subgeneric assignments of the species described above.

Sarcophaga ikat and *S. uncus* are assigned to the subgenus *Sarcorohdendorfia* Baranov, 1938, which is by far the largest subgenus of *Sarcophaga* in the Australasian region (Lopes 1989). Both species agree with the preliminary diagnosis of the genus-group taxon *Sarcorohdendorfia* given by Pape *et al.* (2000), and we have little to add except that some species currently classified in *Johnstonimyia* Lopes, 1959 and *Lioproctia* Enderlein, 1928 may be better assigned to *Sarcorohdendorfia*. This is discussed below and has already been indicated for *Lioproctia* by Pape and Kurahashi (2000: 521), who noted that an "exact separation of the subgenera *Lioproctia* and *Sarcorohdendorfia* is not straightforward." It should be noted that a majority of species currently assigned to *Sarcorohdendorfia* has the male sex equipped with a dense pad of spiny bristles posteriorly on abdominal sternite 4. Some important exceptions exist, however, including a possibly monophyletic group of mainly coastal species: *S. bifrons* Walker, 1853, *S. longifilia* Salem, 1946, *S. megafilosia* Pape, McKillup and McKillup, 2000, *S. meiofilosia* Pape, McKillup and McKillup, 2000, and *S. villisterna* Salem, 1946, as well as the closely related species *S. horti* Blackith and Blackith, 1988 and *S. indusa* (Curran, 1936). Lopes and Kano (1979) mention further species lacking the abdominal pad and even indicate that certain species without the abdominal pad could have their closest relatives among those equipped with a pad. Consequently, defining a genus-group clade to contain only those species with an abdominal pad of bristles on ST4 may create a paraphyletic group and would further require that the abovementioned species without this feature be assigned to other subgenera. Incidentally, the type species of *Sarcorohdendorfia*—*Sarcorohdendorfia adiscalis* Baranov, 1938 [=*S. indusa* (Curran, 1936)]—does not possess the pad on male ST4, and should arguments be found in favour of a clade defined by this structure, it should carry the genus-group name *Tricholioproctia* Baranov, 1938 (type species: *Sarcophaga antilope* Böttcher, 1913). Awaiting better phylogenetic resolution at the species level, we find that the evidence supports the maintaining of *Sarcorohdendorfia* in the present broader sense.

Our arguments for assigning *Sarcophaga serratocudo* to the subgenus *Lioproctia* are drawn from similarities in the male genitalia and differ in this respect little from the prevailing tradition, yet it is our hope that we will be able to improve on the current classification by pointing explicitly to the diagnostic features. First of all, *S. serratocudo* is morphologically very similar to *S. annandalei*, as mentioned under the description above. These two species share in particular a partly flattened juxta with marginal (or apical) serration, tubular lateral vesical projections, and triangular harpes with a rugose surface structure. *Sarcophaga multicolor* Johnston and Tiegs, 1922 also possesses these features (yet this species is easily recognised by the greatly expanded juxtal lobes) and these three species may for this reason constitute a monophyletic group within *Lioproctia*. *Sarcophaga annandalei* has earlier been placed in *Seniorwhitea* Rohdendorf, 1937 (Lopes *et al.* 1977, accepted by Pape 1996), which is a genus-group taxon originally erected by Rohdendorf (1937) to accommodate two morphologically very similar species: *S. orientalis* and *S. orientaloides* Senior-White, 1924 [=*S. princeps* Wiedemann, 1830]. Lopes (1967) added *S. phoenicopterus* Böttcher, 1913. Apparently, Lopes later changed his mind about the proper position of *S. annandalei*; at least Nandi (1978) wrote that "Dr. Lopes in a personal communication in August 1976 informed the author [i.e., Nandi] that *annandalei* belongs to the genus *Lioproctia*." We agree with Lopes (as cited in Nandi 1978) that *S. annandalei*, and with this also *S. serratocudo*, is better accomodated in *Lioproctia* than in *Seniorwhitea*. As defined by Lopes (1967), *Seniorwhitea* is a well-defined taxon with a unique combination of similarities in the male genitalia, *viz*., the micro-spinose humps on the inner margin of male sternite 5, a subapical tuft of setae on the cercus, and a bladder-like, membranous juxta. Neither *S. annandalei* nor *S. serratocudo* possesses any of these features.

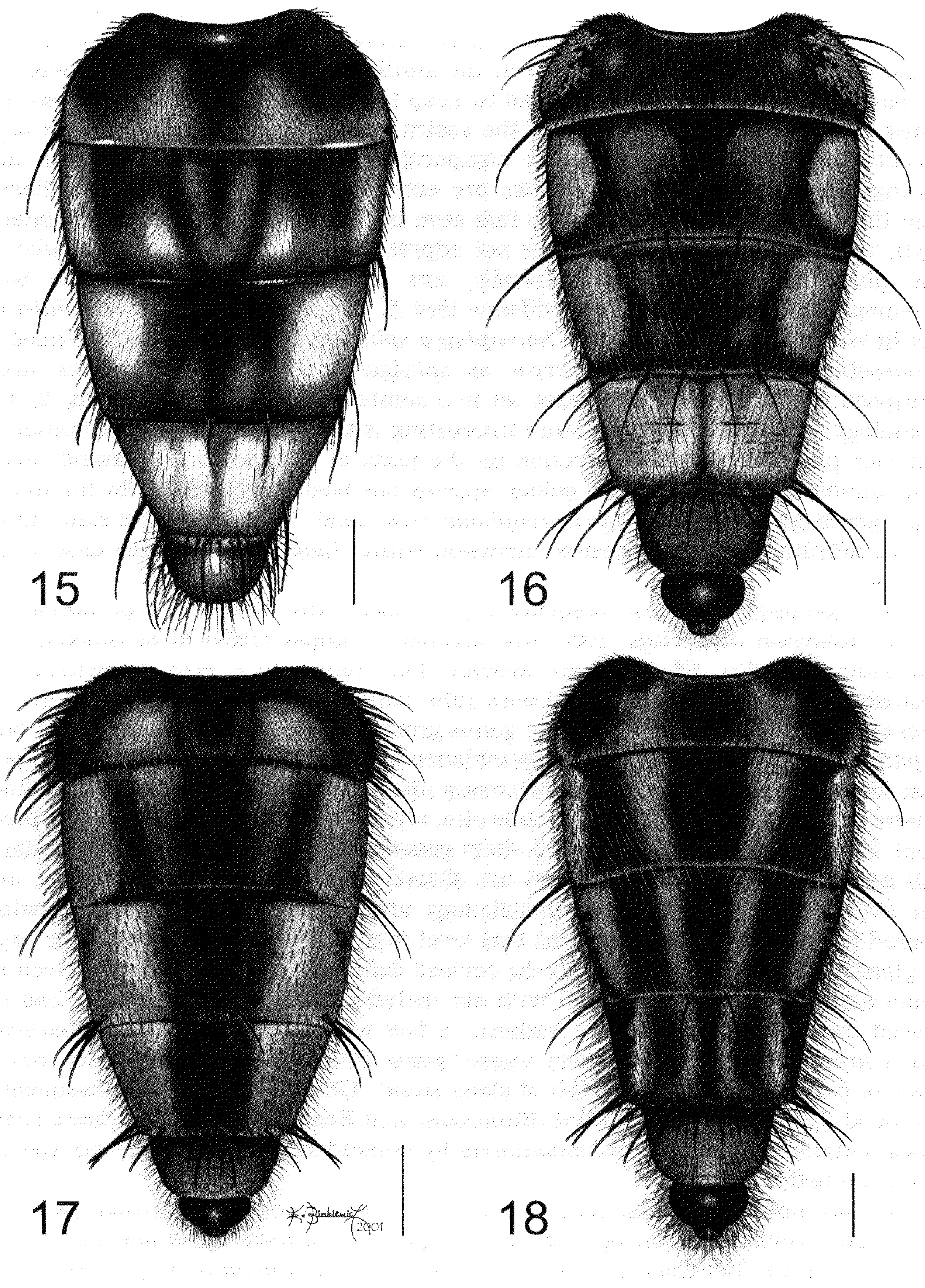
The genus-group taxon *Lioproctia*, with the type species *Sarcophaga aurifrons* Doleschall, 1858 *sensu* Enderlein, 1928, originally included five species (Enderlein 1928) that currently are placed in five different subgenera (Pape 1996). Kano and Lopes (1970) described and named Enderlein's misidentified type species (*Lioproctia enderleini* Kano and Lopes, 1970, preocc.=*Sarcophaga ambon* Pape, 1995) and included in *Lioproctia* three additional species: *S. imitatrix* Lopes, 1959 (preocc.=*S. imita* Pape, 1996), *S. aurescens* (Lopes, 1967), and *S. multicolor* Johnston and Tiegs, 1922. Since then, the taxon *Lioproctia* has grown to eight species in Verves (1990) and 15 species in Pape (1996).

Pape and Kurahashi (2000) and Pape *et al.* (2000) put much weight on the presence of a setose proanepisternum, which was argued to be a synapomorphy shared by species of the three subgenera *Boettcherisca* Rohdendorf, 1937, *Lioproctia*, and *Sarcorohdendorfia*. As was correctly indicated by Verves (1990), exceptions to the setose condition exist in *Lioproctia*. Most importantly, the type species *S. ambon* has a bare proanepisternum. Unless arguments are proposed that will support a homoplasic reversal to a bare condition in the type species, the genus-group taxon *Lioproctia* stands without a coherent definition and possibly contains species more related to (and in that case better assigned to) *Sarcorohdendorfia*.

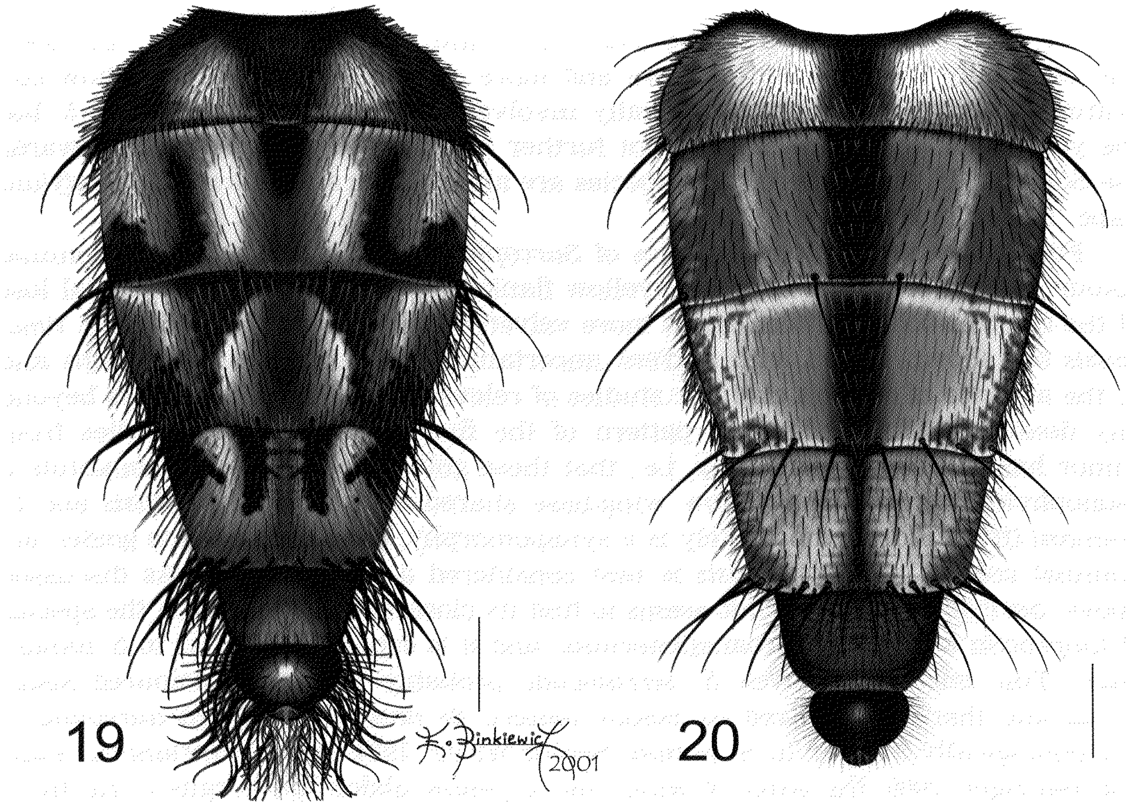
Sarcophaga ambon has a large juxta covered anteriorly with pile-like outgrowths and posteriorly with a more dentate or serrate surface (see Kano and Lopes 1970, fig. 3). In *S. aurescens* and *S. imita* the juxta has a very similar configuration of pile and serrations, and in the latter species the serrations form a marginal row somewhat as in *S. annandalei* and *S. serratocudo* (see Lopes 1967, figs 50, 51; specimens studied for the present paper show even more distinct serration). Kano and Lopes (1970) also pointed to the similarities in juxtal shape between *S. ambon* and *S. imita*, yet they decided to keep these species in separate genera because of differences in the shapes of the vesica and the lateral styli. The juxta in *S. serratocudo* and *S. annandalei* is comparatively smaller and has fewer and stronger marginal serrations, but we are convinced by the structural similarity that this condition is homologous to that seen in *S. ambon* and *S. imita*. The lateral styli, which are robust, parallel yet not adpressed, and directed perpendicular to the phallic axis rather than distally, are additional similarities. The bare proanepisternum is considered evidence that *S. serratocudo* and *S. annandalei* do not fit within *Sarcorohdendorfia*. *Sarcophaga spinifera* Hardy, 1932 was assigned to *Lioproctia* by Lopes (1989, in error as *spinigera*). This species has the juxta equipped with finger-like processes set in a semi-circle (see Hardy 1932, fig. 2), the homology of which is obscure. More interesting is the presence of a combination of anterior pile and posterior serration on the juxta of *S. superba* (Townsend, 1932). This almost entirely yellowish golden species has been kept isolated in the monotypic genus-group taxon *Chrysosarcophaga* Townsend, 1932 (Lopes and Kano 1978), but its affinities with and possible inclusion within *Lioproctia* certainly deserve attention.

The genus-group taxon *Johnstonimyia* Lopes, 1959, with the type species *S. kappa* Johnston and Tiegs, 1921, was erected by Lopes (1959) to accomodate six Australian species. Of these six species, four have since been transferred to (sub)genus *Lioproctia* (Kano and Lopes 1970, 1981; Lopes 1989), which is an indication of the similarity between these genus-group taxa. Because the phallus of *Sarcophaga serratocudo* bears some resemblance to that of *S. kappa* in that both possess slender, divergent, arm-like processes on the vesica, a small juxta, and stout lateral styli with a partly membranous rim, a note on *Johnstonimyia* may be pertinent. Lopes (1959: 48–49) provided a short generic diagnosis of *Johnstonimyia* (as a full genus), in which most features are shared with other genus-group taxa, and the features relating to phallic morphology are too vague, generalised, or widespread to have diagnostic power at this level (e.g., “ventralia bifid, chitinous; styli of glans very stout and short”). In the revised definition of *Johnstonimyia* given by Kano and Lopes (1981: 295)—still with six included species as four others had replaced those excluded by these authors—a few widespread chaetotaxic character states are given, plus the still very vague “penis with well constituted theca, apical plate of paraphallus reduced, styli of glans stout”. Other species were subsequently excluded (Lopes 1989) or included (Shinonaga and Kano 1990) prior to Pape’s (1996) world catalogue, in which *Johnstonimyia* by coincidence still contains six species and is no better defined.

We are not in a suitable position, nor is it the purpose of the present paper, to thoroughly revise the concepts of the (sub)genera *Johnstonimyia* and *Lioproctia*, but we do think that some species listed under *Johnstonimyia* by Pape (1996) carry strong morphological evidence of an affiliation with *Sarcorohdendorfia*. *Sarcophaga gorokaensis* Sugiyama, Shinonaga and Kano, 1988, *S. hugoi* Pape, 1996, and *S. vanuatu* Pape, 1991 all possess a setose proepisternum, and *S. gorokaensis* and *S. vanuatu* in particular, but to some extent even *S. hugoi*, possess a phallic vesica with a distal finger-like projection or hook and a more proximal smaller process,



Figs 15–18. *Sarcophaga* spp., male abdomen, dorsal view. 15, *Sarcophaga* (*Lioproctia*) *aureolata* Pape and Kurahashi, 2000; 16, *S.* (*Sarcorohdendorfia*) *uncus* sp. n.; 17, *S.* (*Lioproctia*) *serratocudo* sp. n.; 18, *S.* (*Sarcorohdendorfia*) *ikat* sp. n. Scale=1.0 mm.



Figs 19–20. *Sarcophaga* spp., male abdomen, dorsal view. 19, *Sarcophaga* (*Sarcorohdendorfia*) *inextricata* Walker, 1859; 20, *S.* (*Sarcorohdendorfia*) *stylata* Pape, 1996. Scale = 1.0 mm.

morphologically very similar to the vesica of many *Sarcorohdendorfia* spp. The greatly modified styli of all three species are highly unique, but their length, considerably surpassing the juxta, may support an affiliation with *Sarcorohdendorfia* rather than with *Boettcherisca*, in which the styli are stouter (Pape *et al.* 2000; Pape and Kurahashi 2000). Accordingly, we propose the new subgeneric affiliations for these three species: *S.* (*Sarcorohdendorfia*) *gorokaensis* Sugiyama, Shinonaga and Kano, 1988 (from *Johnstonimyia*); *S.* (*Sarcorohdendorfia*) *hugoi* Pape, 1996 (from *Johnstonimyia*); and *S.* (*Sarcorohdendorfia*) *vanuatu* Pape, 1991 (from *Johnstonimyia*). This leaves the subgenus *Johnstonimyia* with the species *S. kappa* and *S. lincta* (Lopes, 1959), both of which have a small juxta and straight, rather robust lateral styli, and the morphologically somewhat different *S. fatua* (Lopes, 1967).

Lopes (1959) observed a marked difference in the long, dense setae of male anterior abdominal sternites 1–2 compared with the short, sparse setae of sternites 3–4 in the species he at that time included in *Johnstonimyia*. This feature is also present in *S. serratocudo* and *S. annandalei*, but because the original concept of *Johnstonimyia* has changed considerably, this feature needs to be restudied with a broad taxon sampling for a proper evaluation of its utility in subgeneric classification.

A note on abdominal colour pattern seems pertinent in light of the high fraction of golden-coloured species found on Timor. Palaearctic and most Oriental *Sarcophaga* species. almost exclusively possess a changing silvery-grey/black checker-board-like pattern on the abdomen, as shown in Fig. 19 for *S. inextricata* Walker, 1859. More eastwards and southwards into the Oriental Region, the body and especially the abdomen of more and more species show a partly yellow coloration. This yellow coloration usually involves at least abdominal tergite 5, but the yellow colour increases in extent further into the Australian Region towards the Solomon Islands, where some species are almost entirely yellow, e.g., *S. stylata* Pape, 1996 (Fig. 20).

Four of the five endemic species of *Sarcophaga* on Timor have an abdominal colour pattern of golden or golden-yellow flanks, often combined with partial loss of the checker-board pattern and a more velvety-black dorsum (Figs 15–18, *S. timorensis* not shown). Even with current uncertainties in subgeneric definitions and in the absence of explicit cladistic studies of relevant subgenera, it appears beyond any doubt that the abdominal pattern of the five golden-coloured species from Timor has arisen independently, i.e., that these golden species do not constitute a monophyletic group. The yellow wing-base shared between *S. timorensis* and *S. koimani* (from Flores) most likely is a synapomorphy, in which case the golden abdominal colour in *S. timorensis* is best considered a novel feature. As discussed above, *Sarcophaga serratocudo* seems to find its closest relatives among the species of *Lioproctia* with a bare proanepisternum, and it is especially similar to *S. annandalei*. This means that even *S. serratocudo* probably has a non-coloured sister group and therefore evolved its colour pattern *de novo*. *Sarcophaga aureolata* is morphologically similar to *S. pattoni* Senior-White, 1924 and *S. saprianovae* Pape and Bänziger, 2000, the latter of which has a yellow abdominal tergite 5. All three species have a setose proanepisternum and we cannot exclude the possibility that these species find their closest relatives within *Sarcorohdendorfia*, as already discussed. We have no obvious candidate for the most probable sister group of *S. aureolata*, yet it is noteworthy that the colour pattern with golden flanks is found in no other species currently affiliated within *Lioproctia*.

Summing up, at least two and possibly all of the four golden-coloured species of *Sarcophaga* on Timor may have acquired their colour pattern as an autapomorphic novelty. The selection regime favouring the evolution of this particular colour pattern remains to be studied.

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